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Burkholder

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(54) **WOODWORKING MACHINE FOR SHAPING MOLDING**

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(51) **Int. Cl.**
B27C 5/02 (2006.01)

(52) **U.S. Cl.** **144/134.1**; 144/203; 901/31

(58) **Field of Classification Search** 144/1.1, 144/2.1, 3.1, 24.02, 41, 82, 134.1, 382, 386, 144/388, 391, 394, 430
See application file for complete search history.

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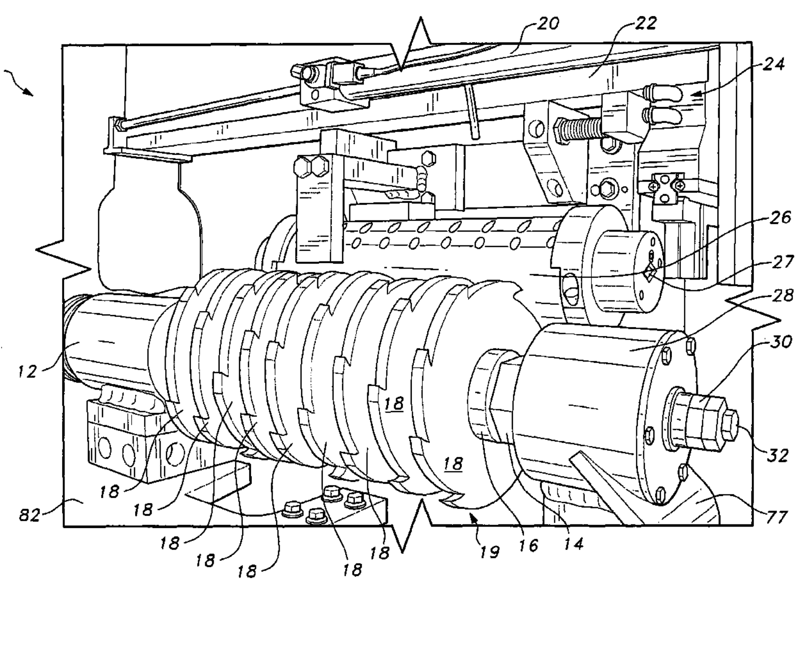
(57) **ABSTRACT**

The woodworking machine for shaping molding has a hollow cylindrical cartridge with end caps having openings defined therein adapted for inserting a blank strip of molding through the cartridge. Robotic grippers advance the molding strip through the cartridge in indexed increments. A cutter assembly is mounted on a movable table, the cutter assembly having a plurality of spaced apart cutters. An electronic control system, preferably including a programmable logic controller, causes the grippers to grip the blank molding, insert the blank through the cartridge, actuate the cutter assembly and move the table so that the cutters simultaneously cut a plurality of notches in the molding, retract the cutter assembly, advance the molding the indexed distance, and automatically repeat the cycle, ejecting the strip when notches have been formed in the entire length of the molding. The machine may be used to form dental molding.

20 Claims, 11 Drawing Sheets



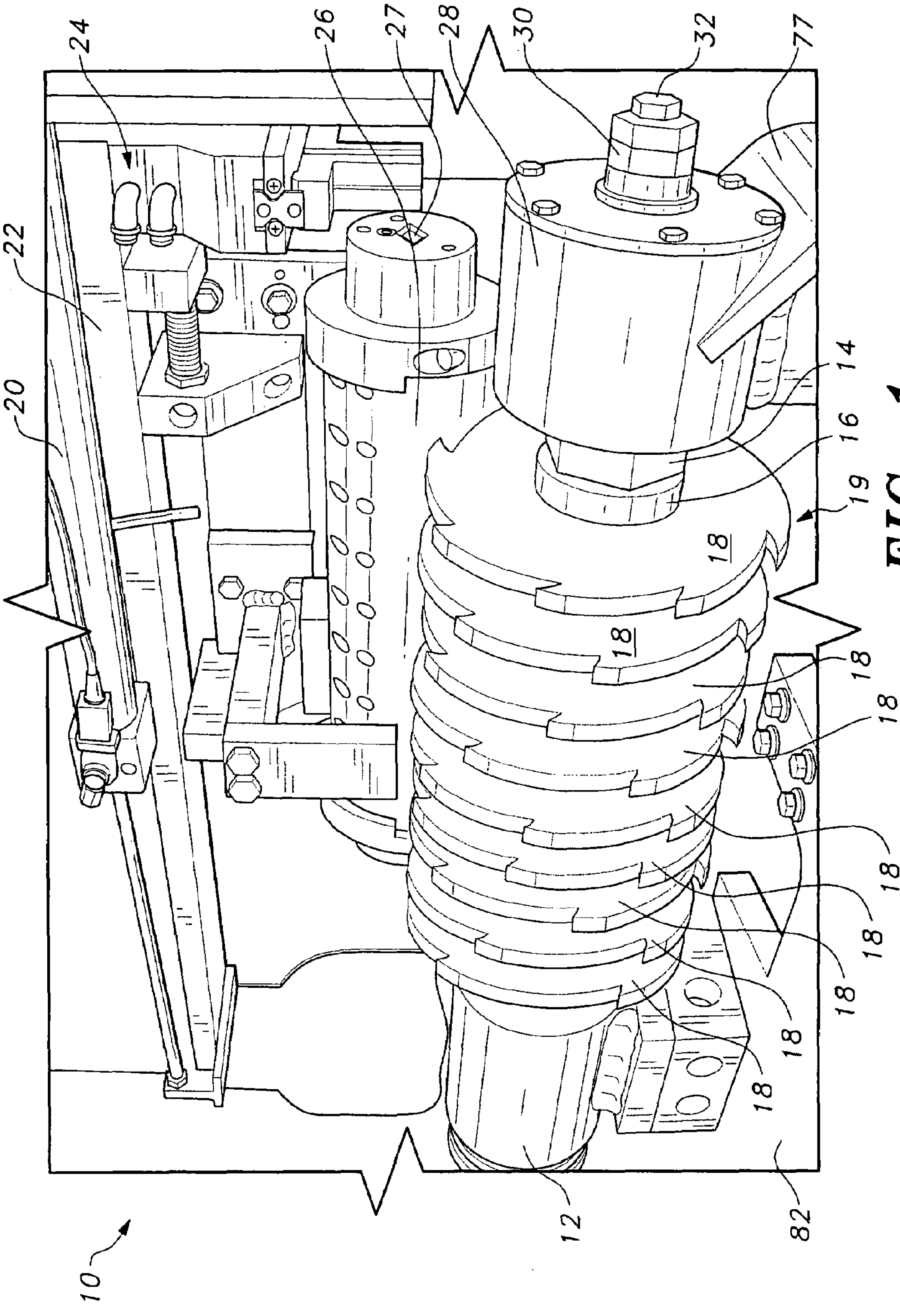


FIG. 1

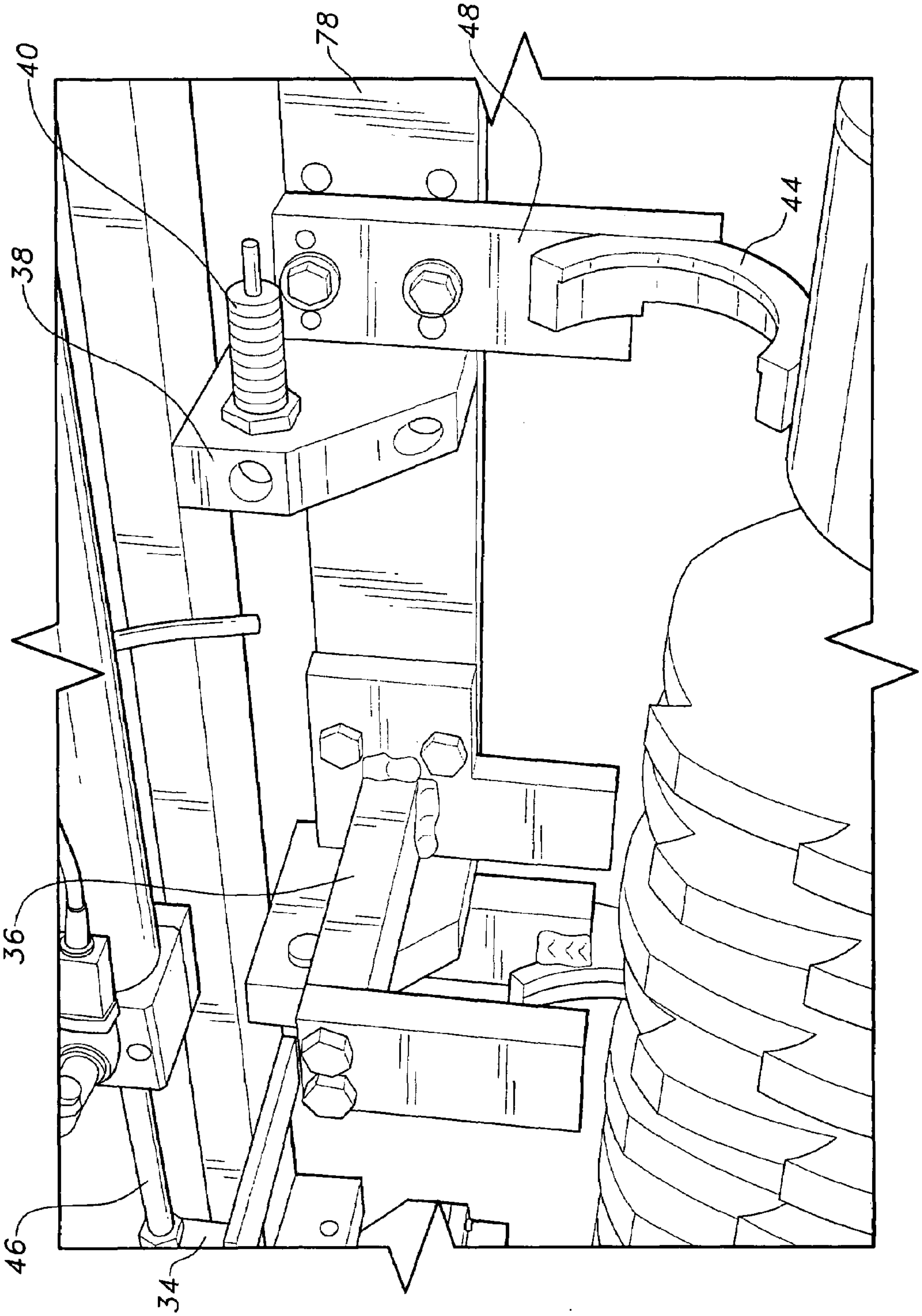


FIG. 2

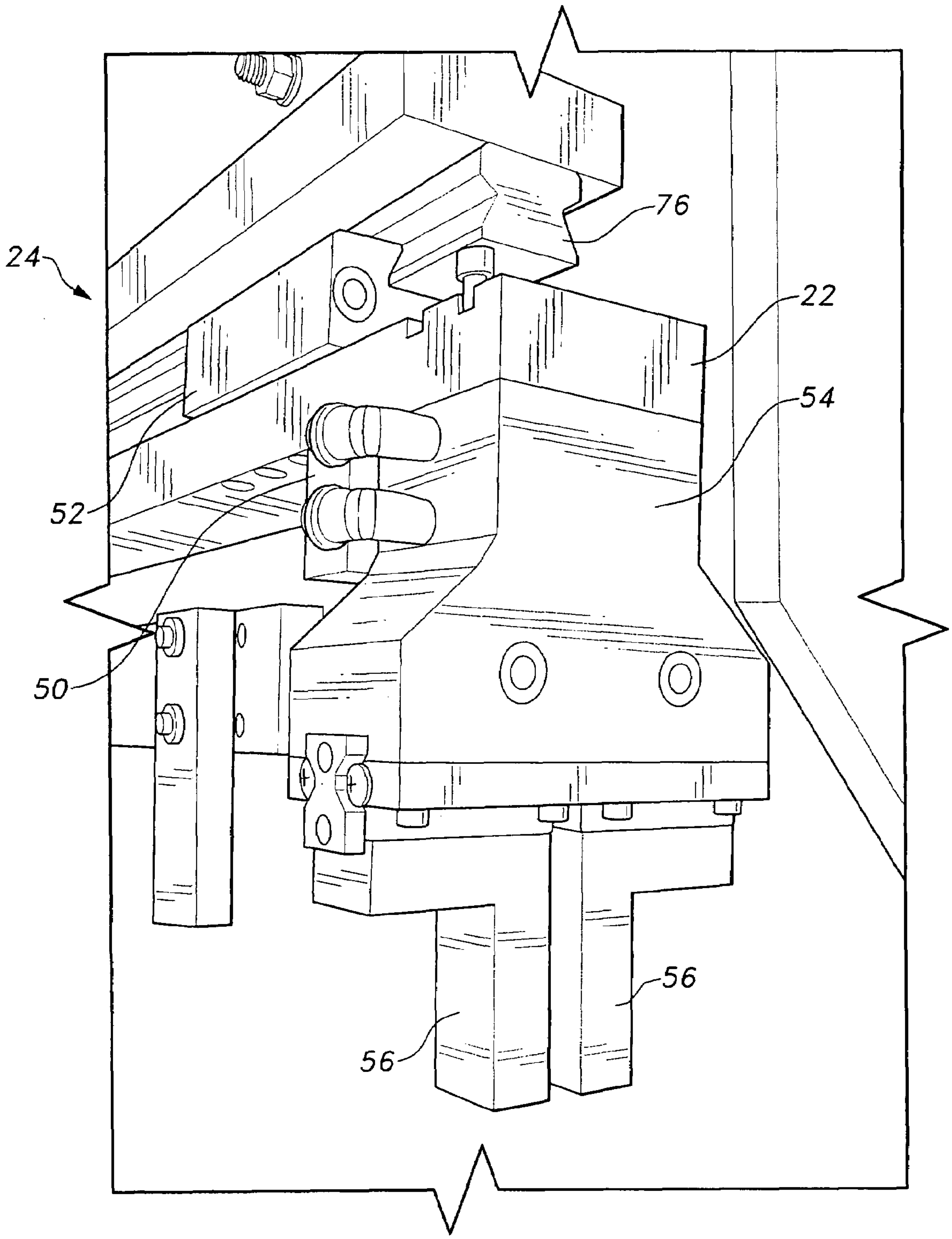


FIG. 3

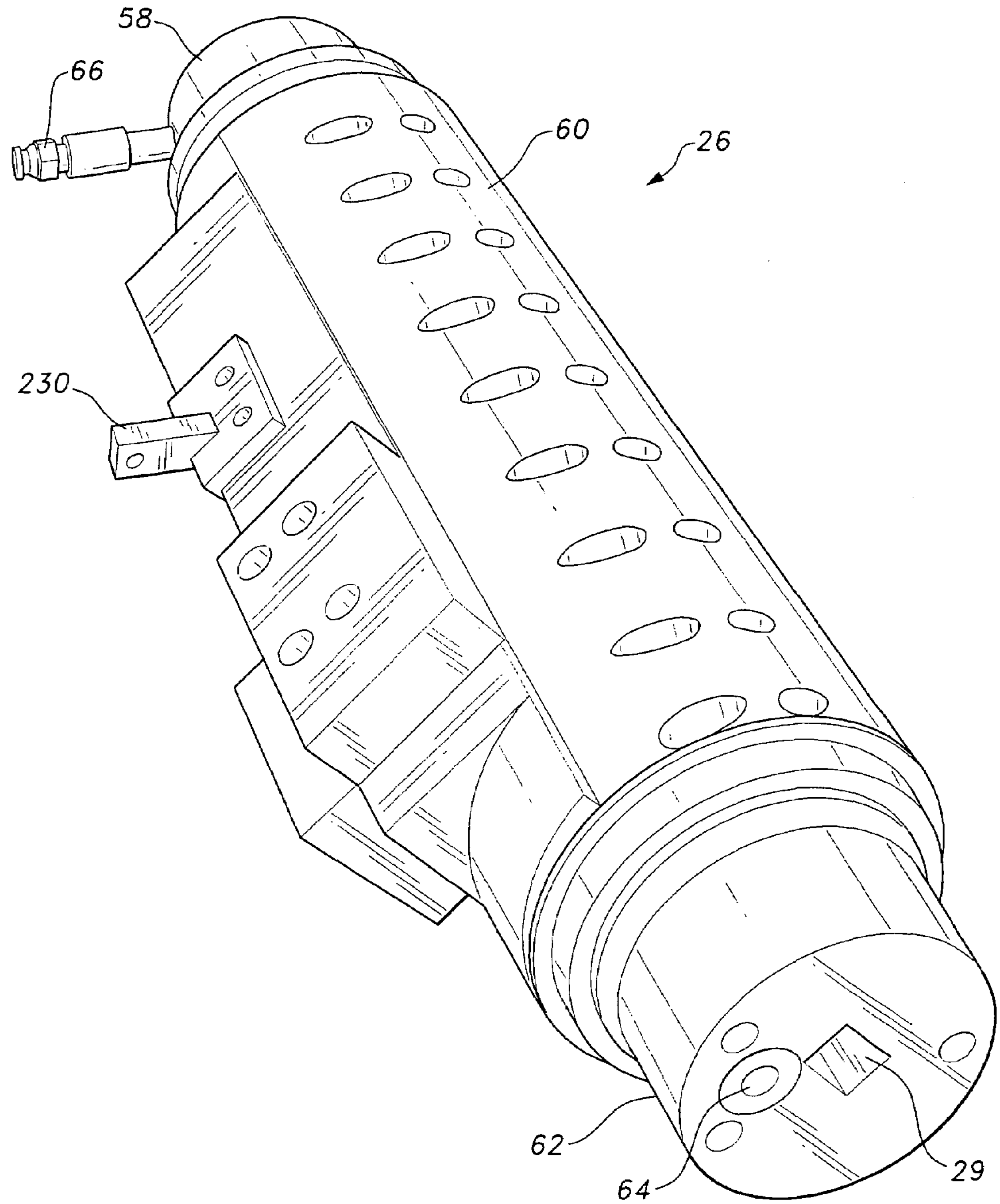


FIG. 4

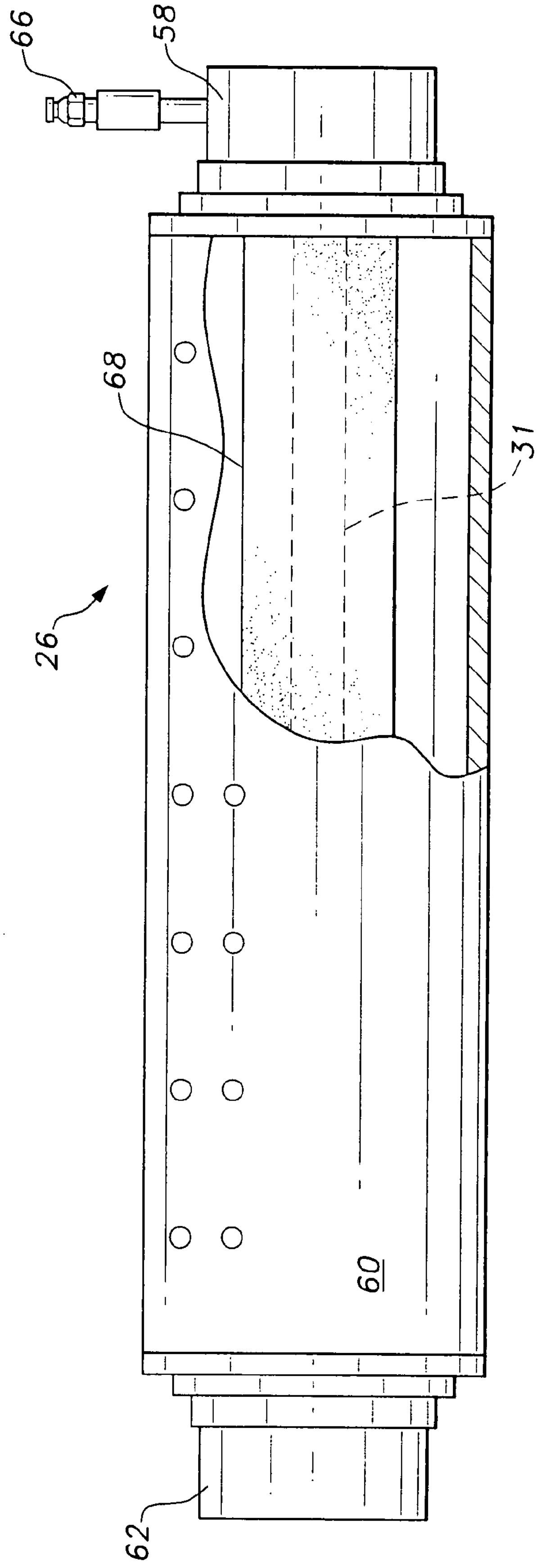


FIG. 5

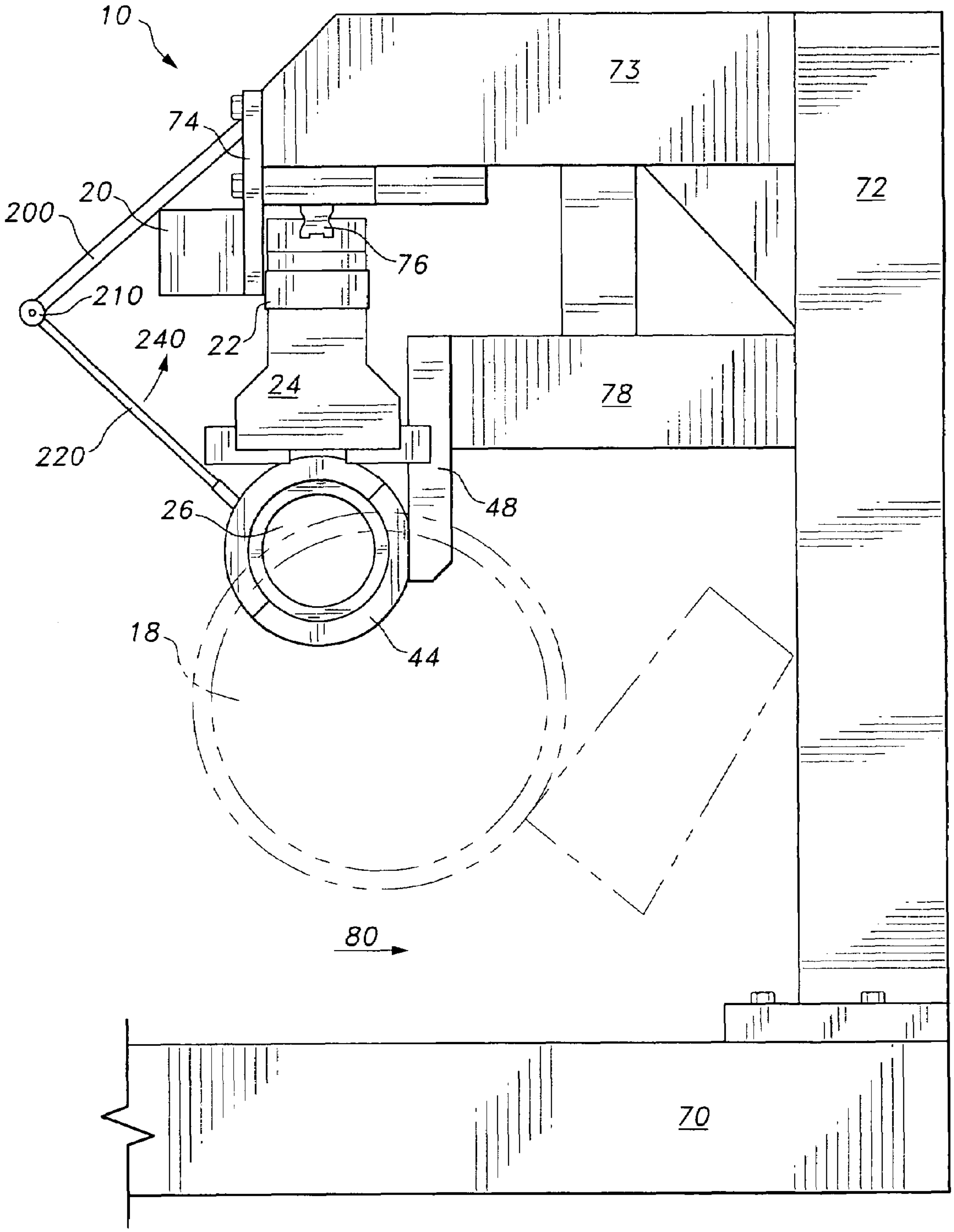


FIG. 6

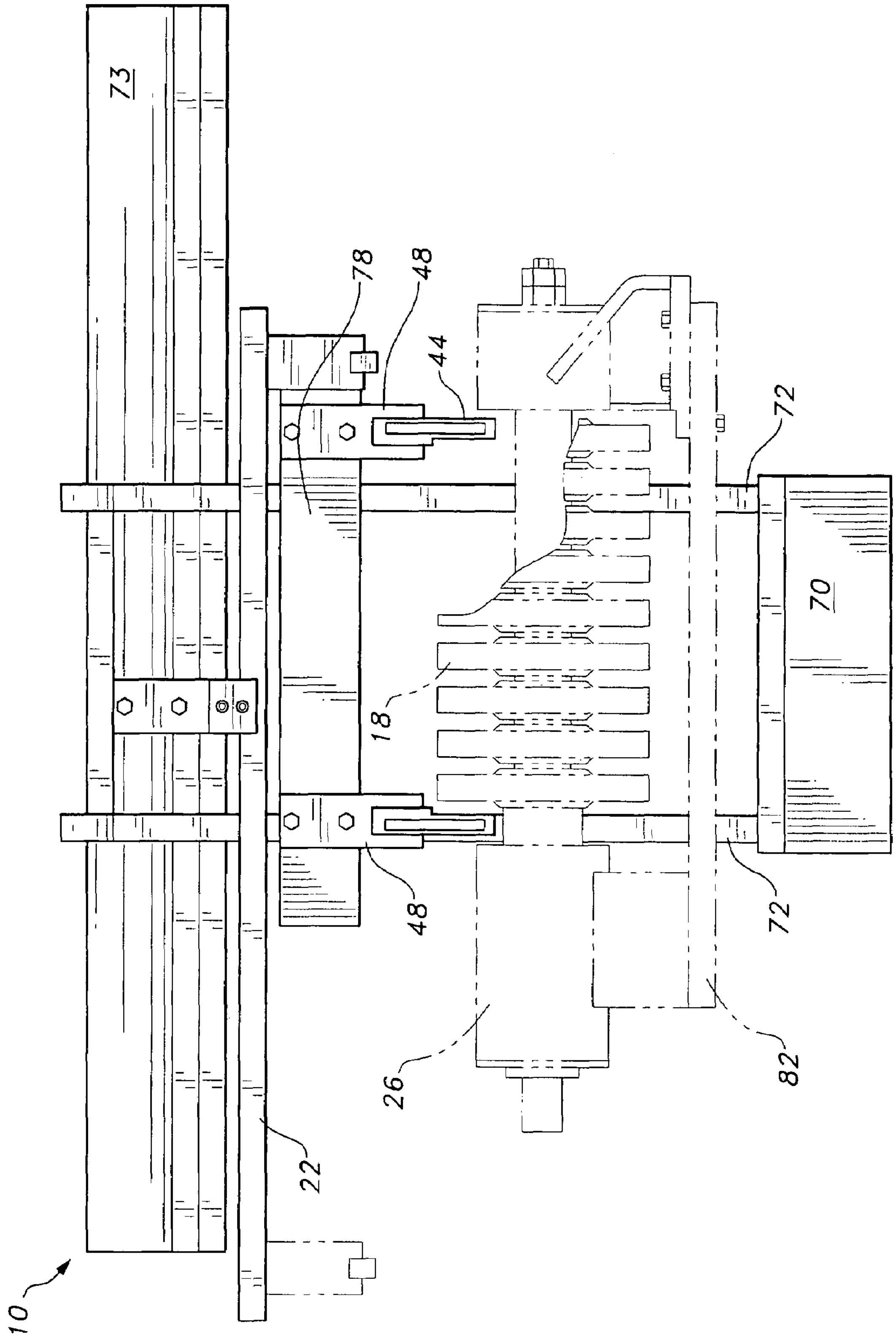


FIG. 7

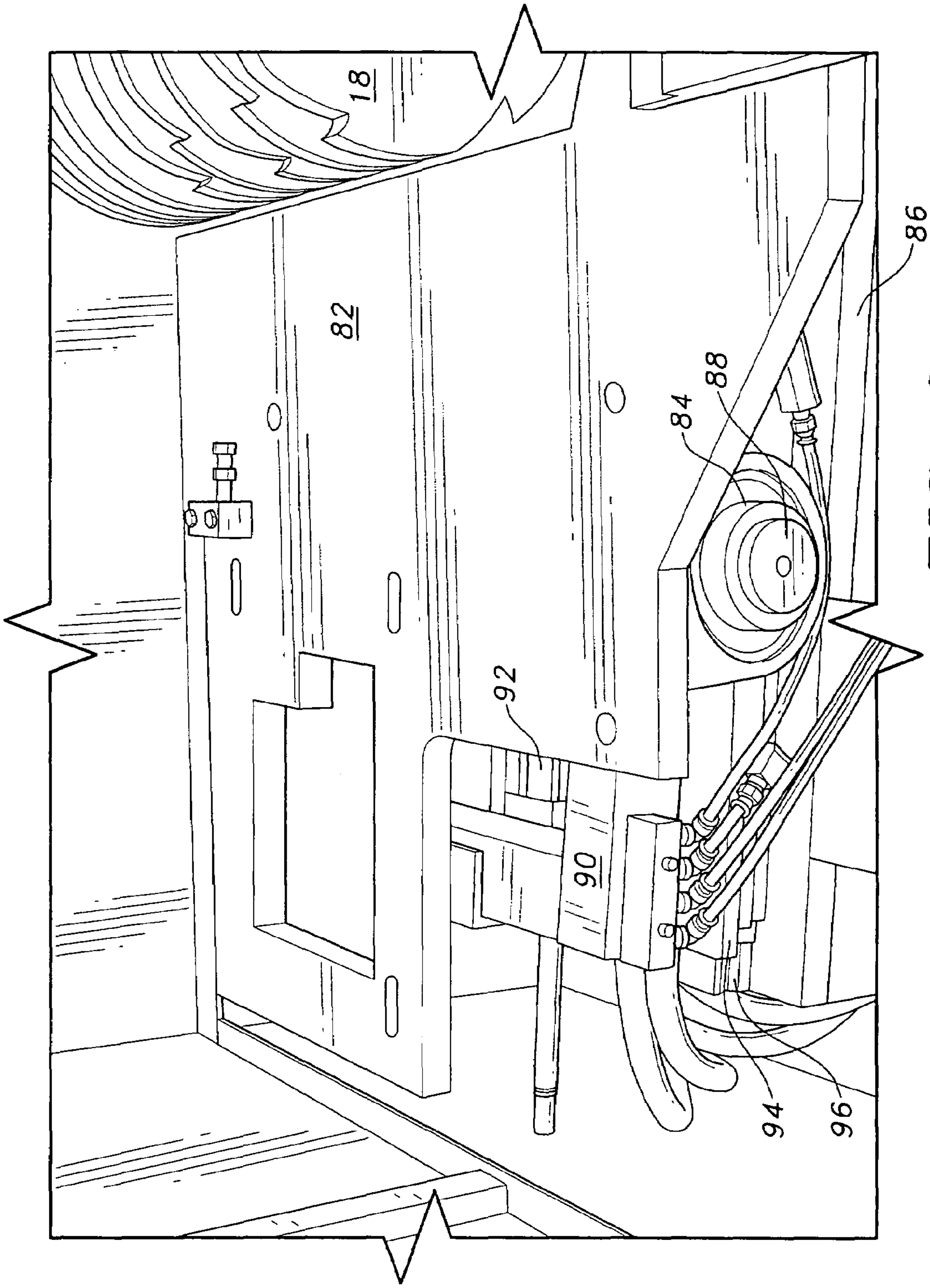


FIG. 8

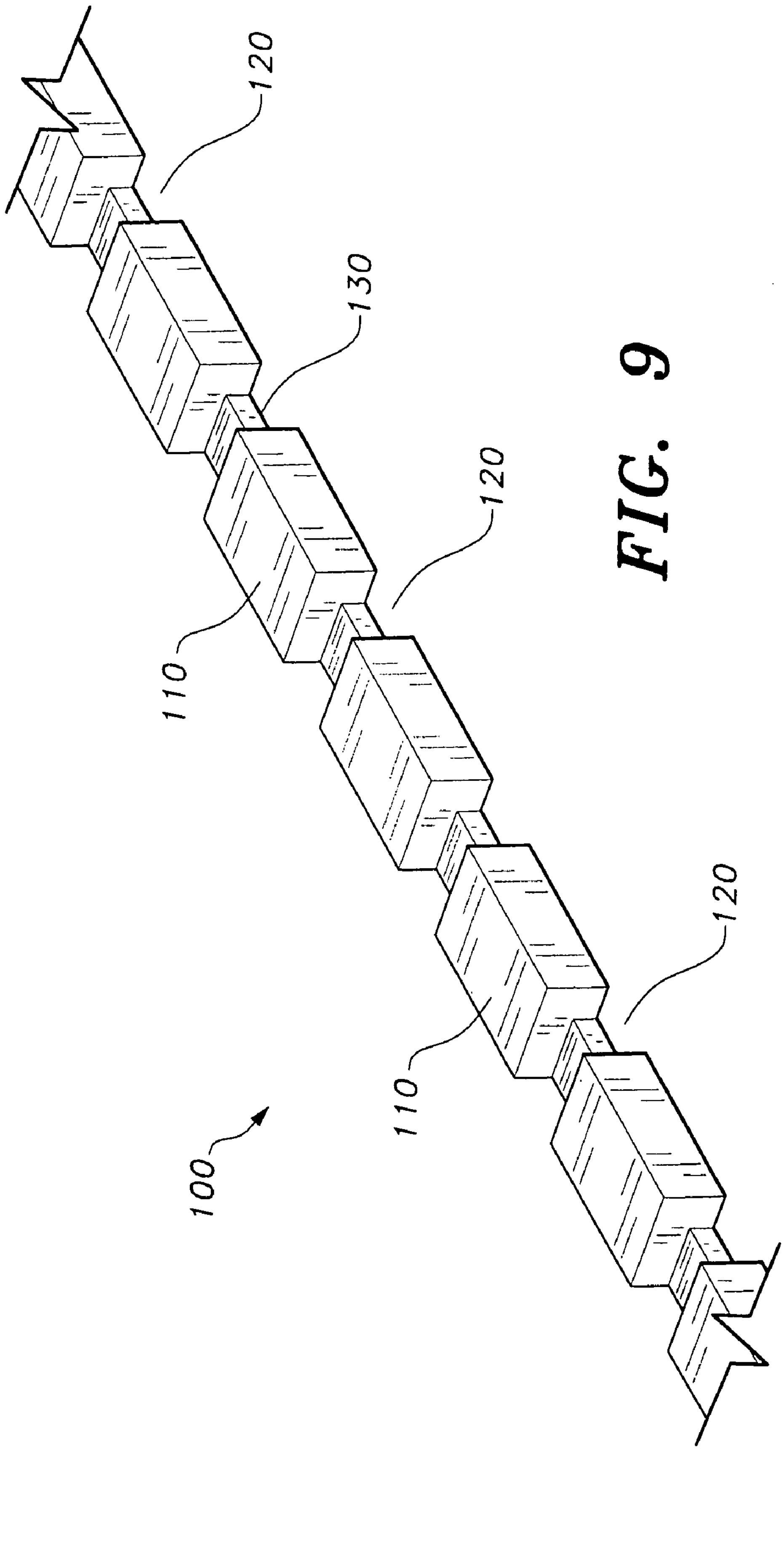


FIG. 9

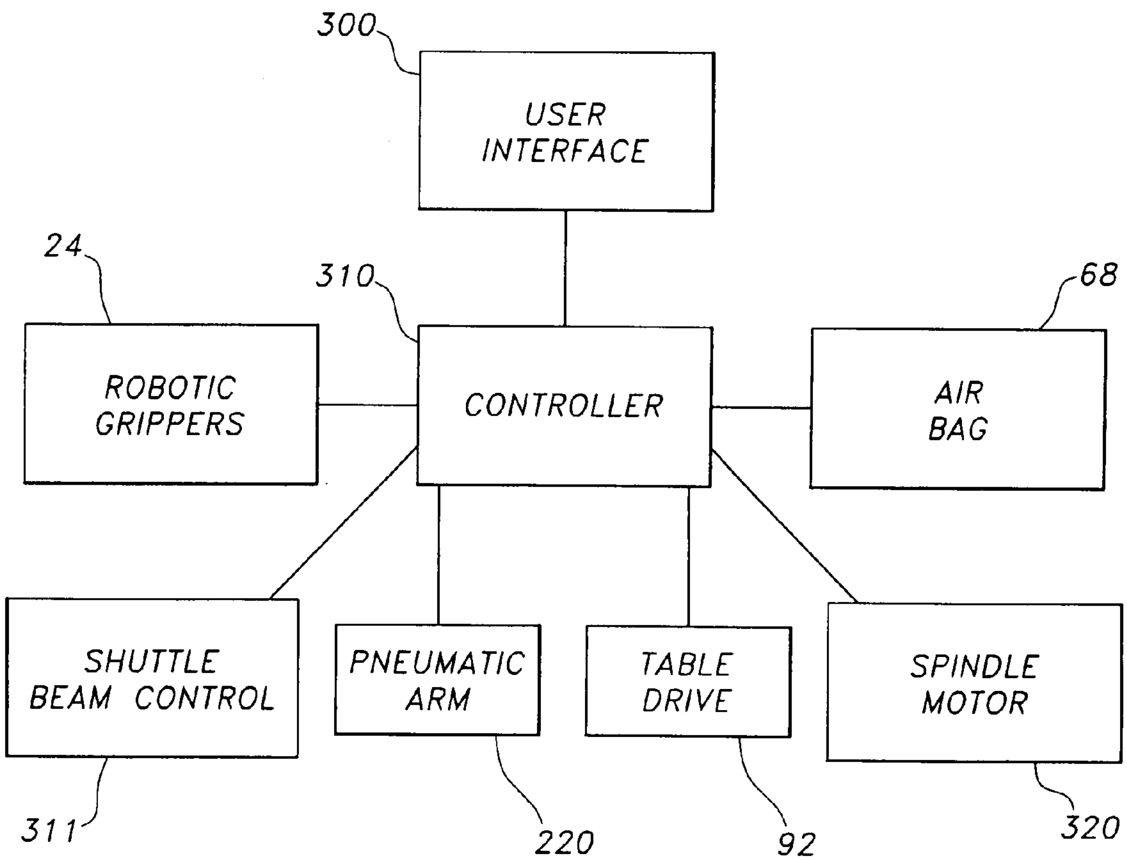
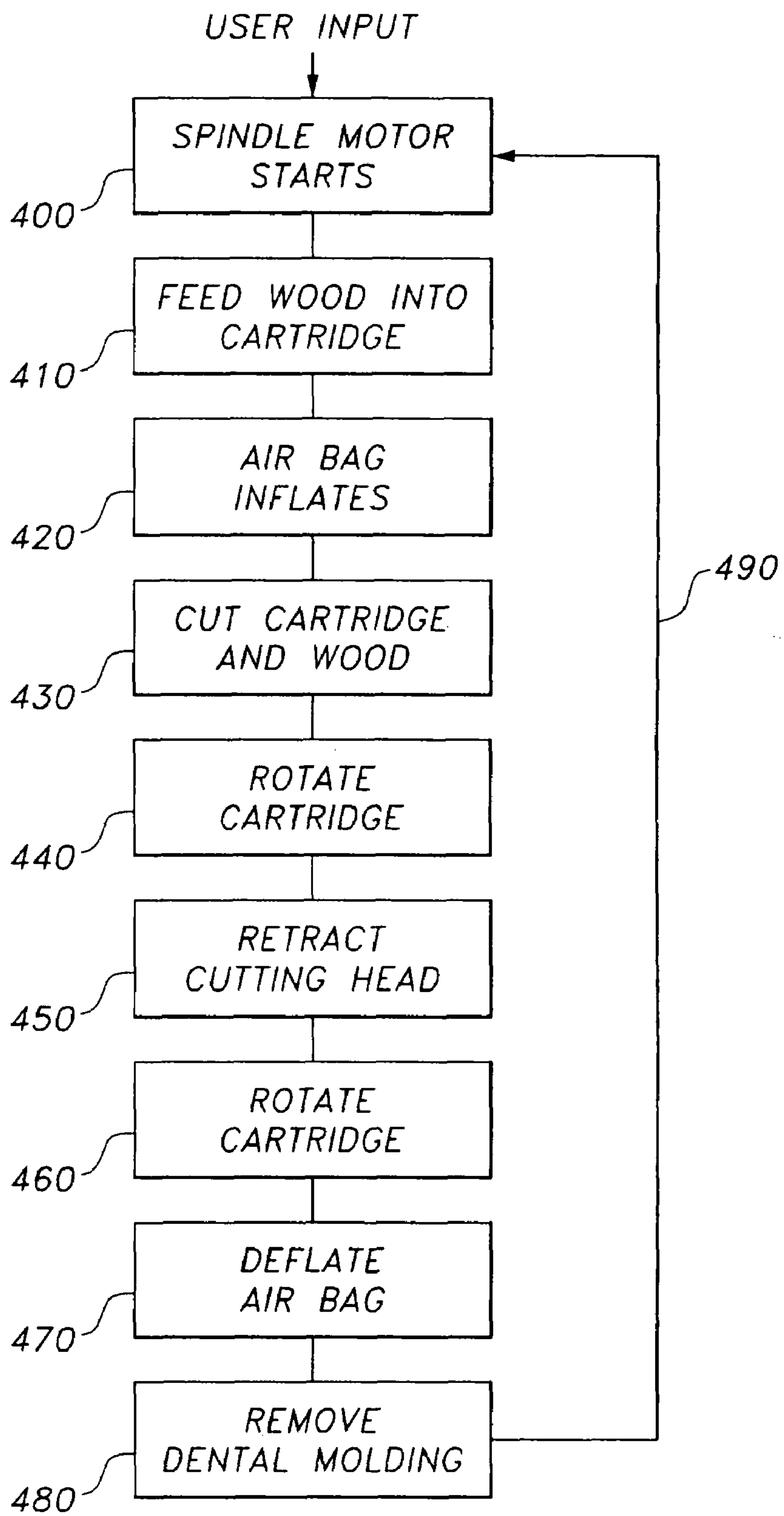

300
USER INTERFACE
24
310
68
ROBOTIC GRIPPERS
CONTROLLER
AIR BAG
SHUTTLE BEAM CONTROL
PNEUMATIC ARM
TABLE DRIVE
SPINDLE MOTOR
311
220
92
320

FIG. 10



USER INPUT
SPINDLE MOTOR STARTS
400
FEED WOOD INTO CARTRIDGE
410
AIR BAG INFLATES
420
CUT CARTRIDGE AND WOOD
430
ROTATE CARTRIDGE
440
RETRACT CUTTING HEAD
450
ROTATE CARTRIDGE
460
DEFLATE AIR BAG
470
REMOVE DENTAL MOLDING
480
490

FIG. 11

WOODWORKING MACHINE FOR SHAPING MOLDING

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/831,617, filed Jul. 19, 2006.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to woodworking machines, and particularly to a woodworking machine for shaping molding that is automated for high speed and production. The woodworking machine is particularly well adapted for the high speed production of a type of molding known in the trade as dental molding for decoration of buildings, furniture, etc.

2. Description of the Related Art

Dental molding is a type of molding used in the construction, furniture making, and woodworking industries. As with any type of molding, dental molding can be used to cover joints and for decorative purposes, such as ornamentation on the exterior surfaces of a building, e.g., at the cornice, and for covering the rough edges of plywood, particle board, and other boards used in woodworking for shelves, cabinets, and the like, and for many other applications.

Dental molding is typically formed from blank molding strips furnished by lumber mills in various lengths, e.g., ten to sixteen feet, and in square or rectangular cross section from ¼"×¼" to 1"×1". These dimensions are given for exemplary purposes only, and it should be understood that dental moldings are manufactured in a wide range of sizes. Notches of uniform depth are cut into at least one side of the blank at equally spaced distances to form teeth or dental blocks. The notches may be cut into one or two sides of the blank molding to form different decorative effects. Typically the location of the teeth are manually marked on the blank strip of molding, and the notches are cut one at a time by a table saw, radial saw, or the like equipped with a dado blade, or by a router equipped with an appropriate dado bit.

This process is, however, very labor intensive, and requires a fair amount of skill to keep the spacing and depth of the notches uniform. When the strip is to be cut into shorter lengths, a great deal of planning is required to space the notches properly to allow for the crosscut that will separate the blank strip into shorter lengths. While this process may be manageable for the isolated odd job, it would be desirable to have an automated machine that can produce a volume of strips of ornamental molding, particularly dental molding, quickly for preparing stocks of pre-formed molding for sale at hardware stores, lumber yards, and the like

Thus, a woodworking machine for shaping molding solving the aforementioned problems is desired.

SUMMARY OF THE INVENTION

The woodworking machine for shaping molding is an automated woodworking machine for the high-speed production of dental moldings and the like. The machine includes a substantially cylindrical cartridge assembly, which is hollow and defines an open interior region therein. The cartridge extends along a longitudinal axis. An outer portion of the cylindrical cartridge is preferably formed from a plastic material, and an air bag is disposed within the cylindrical cartridge in the open interior region. A blank strip of molding is inserted into the open interior region of the cartridge assembly, and a

cutter assembly cuts a plurality of notches in both the cylindrical cartridge assembly and the workpiece to form the dental molding. The air bag, under external control, stabilizes the wooden block within the passage, and is in communication with an external source of compressed air.

The cutter assembly has a plurality of rotary cutters and is positioned on a movable table, which, under external control, automatically moves towards the cylindrical cartridge assembly to engage the cartridge assembly and the workpiece. Further, under external automatic control, the cartridge assembly may be rotated about the longitudinal axis thereof. Preferably, a pneumatic arm is joined to both a structural frame of the woodworking machine and to the cylindrical cartridge assembly for controlled rotation thereof.

Once the dental molding has been formed, the dental molding is automatically ejected from the cartridge assembly, and another workpiece may be inserted therein. A different cartridge is used for blank moldings of different cross-sectional size. Used cartridge assemblies may be removed and replaced, and the insertion of the workpieces is performed by an automatic robotic gripping mechanism, which is preferably a pneumatic system and is under external automatic control.

These and other features of the present invention will become readily apparent upon further review of the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a partial perspective view of a woodworking machine for shaping molding according to the present invention.

FIG. **2** is a partial perspective view of the woodworking machine for shaping molding according to the present invention with the cartridge removed.

FIG. **3** is a partial perspective view of the woodworking machine for shaping molding according to the present invention showing details of one of the robotic grippers.

FIG. **4** is a perspective view of a cartridge assembly of the woodworking machine for shaping molding according to the present invention.

FIG. **5** is a front view of the cartridge assembly of the woodworking machine for shaping molding according to the present invention with the cartridge broken away and partially in section.

FIG. **6** is a partial side view of the woodworking machine for shaping molding according to the present invention.

FIG. **7** is a partial front view of the woodworking machine for shaping a molding according to the present invention.

FIG. **8** is a partial perspective view of the woodworking machine for shaping a molding according to the present invention showing the movable table thereof.

FIG. **9** is a perspective view of an exemplary dental molding produced by the woodworking machine for shaping molding according to the present invention.

FIG. **10** is a block diagram of an electronic control system for a woodworking machine for shaping molding according to the present invention.

FIG. **11** is a flowchart of the steps executed by a woodworking machine for shaping molding according to the present invention during each cutting cycle.

Similar reference characters denote corresponding features consistently throughout the attached drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is directed towards a woodworking machine for shaping molding, generally denoted as **10** in the drawings. An exemplary dental molding **100** that can be formed by the machine **10** is illustrated in FIG. **9**. Moldings of the type shown in FIG. **9** are commonly referred to as "dental moldings". Typically, dental moldings are elongated members that may be used in building construction for decorative purposes in furniture and cabinet making, in woodworking, and the like. Dental moldings, such as dental molding **100**, may be formed from wood or similar materials. The molding **100** is formed by shaping an elongated strip of blank molding that is square or rectangular in cross section by cutting notches in one or more sides of the feedstock in order to form teeth **110** spaced apart by the notches **120**.

The teeth **110**, notches **120** and connecting links **130** of the molding **100** may have any customized dimension and configuration. The exemplary molding **100** of FIG. **9** was formed by cutting notches in two sides of the blank molding. However, notches **120** can be cut into only one side of the molding blank to form a different ornamental effect, if desired. Preferably, each tooth **110** is substantially identical in size and contour to the adjacent teeth **110**, and, further, each notch **120** is of a uniform size. It should be understood that dental molding **100** is shown for exemplary purposes only, and the contouring and size of teeth **110** and notches **120** may have a different configuration from that shown in the drawing. For example, the teeth **110** shown in the drawing have orthogonal side faces. However, the machine **10** may be configured to cut the teeth with angled, sloping lateral faces connected to the links **130**, or with arcuate faces, if desired.

Machine **10**, illustrated pictorially in FIGS. **1-8**, is an automated device for the production of dental moldings, such as the exemplary dental molding **100**. In use, a workpiece or blank stock elongated strip of square or rectangular molding is fed into machine **10** (from the right in FIGS. **1** and **7**) to be gripped by a robotic gripper mechanism **24**. An external guide may be optionally utilized prior to gripping mechanism **24** grasping the stock workpiece. The stock is typically an elongated strip of molding having a square or rectangular cross-sectional contour. Typical moldings are approximately eight to sixteen feet in length, although the dimension and configuration of the stock may vary, depending upon the source and type of lumber. The gripping mechanism **24** is, in the preferred embodiment, a robotic gripper operated under external automatic control. One such exemplary robotic gripper is the RP-35P, manufactured by Robohand®, Inc.

Upon initiation of the production cycle, the user enters input parameters to machine **10** via a user interface **300** (shown in the block diagram of FIG. **10**), which may be a control panel, keyboard or the like. The input may include parameters for the particular molding **100** to be formed, initiation codes or the like. The user input is fed into a programmable logic controller (PLC) **310**, which may be in the form of a computer, processor, or the like. Upon initiation of the production process, a spindle motor **320** (to be described in detail below) is actuated to generate rotation in a cutting head. Actuation of the spindle motor is designated as step **400** in the flowchart of FIG. **11**.

A second gripping mechanism **24** may be positioned adjacent the opposite end of the cartridge **26** (to be described in detail below) for removing the dental molding **100** once it has been fully formed, as well as for advancing the molding incrementally through the machine **10** between cutting cycles. Referring back to FIG. **1**, the gripping mechanisms **24** are mounted on a shuttle beam **22**, which further supports a pneumatic cylinder **20**, providing a pressurized driving source for gripping mechanisms **24**. The first gripping mechanism **24**, after grasping the stock, feeds the stock into a cartridge assembly **26** (step **410** in FIG. **11**).

As best shown in FIGS. **4** and **5**, cartridge assembly **26** is hollow and defines an open inner region **31** therein. The open inner region **31** receives the stock, with an entry opening **27** being formed through one end wall (shown in FIG. **1**) of the cartridge in-feed end cap **58**, and an exit opening **29** formed through the opposing end wall of the cartridge out-feed end cap **62**. The edges of the entry opening **27** are chamfered or beveled in order to facilitate pushing the molding blank into the cartridge assembly **26**. At step **410**, upon the feeding of the wooden work piece within cartridge **26**, the insertion of the workpiece may be controlled by a separate user-programmable and actuatable shuttle beam controller **311**, which is in communication with main controller **310** (shown in FIG. **10**).

In the preferred embodiment, the initial workpiece stock has a substantially rectangular cross-sectional contour, and the dental molding (such as the exemplary dental molding **100**) also has a substantially rectangular cross-sectional contour. Thus, entry opening **27** and exit opening **29**, in the preferred embodiment, each have a substantially rectangular contour. However, it should be understood that openings **27**, **29** may have any desired cross-sectional contour.

The cartridge assembly **26** includes a main cylindrical body **60**, which is preferably formed from plastic or the like. As shown in FIG. **5**, an air bag **68** is mounted within the cylindrical body **60** and is positioned within region **31** (the phantom or dashed lines in FIG. **5** are not meant to imply that the feedstock is behind or within air bag **68**, but merely indicate the relative location on the exterior of the air bag **68** where the feedstock is located, the air bag **68** being behind the feedstock and supporting the feedstock as the notches are cut). When the stock is fed into region **31**, the air bag **68** is inflated by compressed air to support and position the workpiece stock (step **420**). By varying the pressure of air within air bag **68**, the stock may be moved, under external control, in both the horizontal and vertical directions, within region **31** during the cutting process. The inflation and deflation of air bag **68** is controlled by PLC **310**.

An inlet port **66** is formed on cartridge in-feed end cap **58** for connection with an air compressor. The inlet port **66** is in communication with air bag **68** for the inflation thereof. A vacuum pump is further in communication with air bag **68** for the controlled deflation thereof, following the completion of a cutting cycle. An air bag end plug **64** is shown formed in the cartridge out-feed end cap **62**, as shown in FIG. **4**.

As best shown in FIGS. **6** and **7**, the cartridge assembly **26** is mounted in a cartridge holder bracket **44**. The cartridge assembly **26** is removable and replaceable, a different cartridge being used for each size of blank molding. During the cutting process, the cartridge assembly **26** is also cut (as will be described below), and used cartridges may be removed from brackets **44** and replaced with new cartridge assemblies **26**. Cartridge holder brackets **44** are supported by a horizontal support beam **78**, mounted to a rear support **72** of machine **10**. FIG. **2** illustrates the cartridge holder brackets **44** with cartridge assembly **26** removed from machine **10**.

As shown in FIG. **1**, a cutter assembly **19**, which includes an array of cutters **18** mounted on a central spindle, is mounted between a spindle headstock assembly **12** and a removable tail stock assembly **28**. It should be understood that in FIG. **1** the cutters **18** are shown diagrammatically as substantially circular toothed blades. In practice, each cutter **18** preferably comprises a disk-shaped cutterhead having a plurality of inserts mounted about its periphery, the inserts having a blade, preferably a carbide-tipped blade, mounted therein, the cutter insert being clamped to the cutterhead. The blade made be any blade or knife adapted for cutting notches in the molding stock, and may include side spurs on both sides of the cutterhead to clip the wood grain ahead of the main cutting blades. Alternatively, cutters **18** may comprise a dedicated, one-piece cutter. As used herein, the term cutter assembly **19** refers to the combination of the spindle, a plurality or array of cutters **18**, and, as will be described below, cutter spacers. Any suitable number of cutters **18** may be mounted on the spindle to form cutter assembly **19**, although in the preferred embodiment, approximately nine cutters **18** are used.

Cutters **18** are spaced apart by a plurality of cutter spacers **16**. The spacing of the cutters **18** is user adjustable and selectable, depending upon the size of the teeth **110** and notches **120** of the dental molding **100**. Although cutter assembly **19** is shown having nine cutters **18** for simultaneously cutting nine notches to form eight teeth, the cutter assembly **19** may have any desired number of cutters **18**. Rather than cutting the stock directly to form notches **120** of dental molding **100**, the cutters **18** cut into cartridge assembly **26** and through the plastic main body **60**, which holds the stock therein. The cutter assembly **19** is driven by a spindle motor **320**, in communication with PLC **310**. Once the stock has been fed into cartridge assembly **26** (step **410**), the air bag **68** is inflated (step **420**) to secure the stock therein, and the cutter assembly **19** is driven to cut into the cartridge assembly **26** and the stock (step **430**).

If cutters **18** were to cut only the workpiece stock, splintering or other damage of the unsupported stock might occur. The cutting of both the plastic main body **60** and the wood stock provides protection, support and shielding for the wood stock during the cutting process. During the cutting process, gouges or grooves are cut into the plastic main body **60**. As noted above, used cartridge assemblies **26** may be removed and replaced with new, uncut cartridge assemblies **26**.

During the cutting process, the workpiece stock is moved along the longitudinal axis of the cartridge assembly **26** through interior region **31** by the gripping mechanisms **24**. The first gripping mechanism **24** inserts the stock into cartridge assembly **26**, and a second gripping mechanism **24**, as noted above, positioned on the opposite end of cartridge assembly **26**, removes the cut molding **100** from the opposite end of the cartridge **26**. Cartridge assembly **26** is further rotated, under external control, by a pneumatic arm **220** (shown in FIG. **6**), which is joined at one end to the pneumatic connector member or bracket **230** (shown in FIG. **4**) of the cartridge assembly **26**.

Cartridge assembly **26** is first held in an initial position while gaps **120** are cut in the horizontal direction. Cartridge assembly **26** is then rotated by approximately 90° so that the cutters **18** may continue cutting the gaps **120** in a vertical direction (step **440**). As will be described in greater detail below, at this stage, upon actuation of system **10**, a movable tilt table **82** (upon which the spindle is mounted), is raised to an elevated position, and remains in this position until the end of the cutting cycle, although the exact functioning of the movable tilt table **82** is preferably programmable, and user-selectable and adjustable.

The wooden workpiece is positioned within cartridge **26** so that when the cartridge **26** undergoes the 90° rotation, the cutting blades remain at the correct depth within the wood. Further, the other end of pneumatic arm **220** is pivotally joined by a pivot pin **210** or the like to an angled support **200** secured to upper wall **73**. Under external pneumatic control (via communication with PLC **310**), pneumatic arm **220** rotates (as indicated by directional arrow **240**) about support **200**, thus causing controlled rotation of cartridge assembly **26** during the cutting process. It should be understood that the user may choose not to rotate the cartridge assembly **26** during the woodworking process. The rotation of the cartridge assembly **26** creates a dental molding having notches formed in two orthogonal faces of the workpiece. The user may choose to create a dental molding having notches formed in only a single face of the workpiece, and may therefore choose to eliminate the rotation of cartridge assembly **26**.

In addition to the rotation of the cartridge assembly **26**, the cutters **18** are moved in the horizontal direction (indicated by directional arrow **80** in FIG. **6**), to cut into the cartridge assembly **26** and the workpiece. The spindle headstock assembly **12** and the removable tail stock assembly **28** are mounted on a movable table **82** (shown in FIG. **8**). Under external control by PLC **310**, movable table **82** moves in the horizontal direction under hydraulic drive, through the use of a hydraulic cylinder **92** or the like, or through the application of any suitable user-controllable drive means.

Table **82** is mounted on linear bearings **94**, which are supported by rails **96**. Table **82** is further mounted on a carriage weldment **90** of the movable carriage, with the entire assembly being mounted on a machine base **86**. In addition to horizontal movement, the table **82** may alternatively rotate about a table pivot shaft **88**, which may further include table tilt bearings **84**. In the preferred embodiment, the hydraulic drive moves the cutter assembly **19** and associated drive motor approximately six inches, and is supported on a pair of rails **96**. Cutter assembly **19** may be contained within a dust shield, preferably connected to a vacuum source, to protect the cutters **18**, the drive source, and the external environment from saw dust created during the woodworking process.

Following the cutting process, the cutter assembly **19** (and the table upon which the assembly **19** is mounted) is retracted (step **450**), and the cartridge assembly **26** is rotated back to its initial angular position (step **460**). The air bag **68** is deflated by a vacuum pump or the like (step **470**), under control of the PLC **310**, and the molding **100** is advanced by an incremental length to repeat the cycle, or the completed molding is expelled and removed (step **480**) from exit opening **29** (via the second gripping mechanism) and a new, uncut workpiece may be fed into opening **27** by the first gripping mechanism **24** to begin the process again for formation of another dental molding **100** (indicated by arrow **490** in FIG. **11**).

As shown in FIGS. **6** and **7**, the machine **10** includes a base **70**, adapted for mounting on a suitable support surface, such as the floor. A rear support **72** is joined to a rear edge of base **70** and extends upwardly therefrom. Upper wall **73** is mounted on an upper end of rear support **72** and projects forwardly therefrom. Base **70**, rear support **72** and upper wall **73** may be formed from metal or any other suitable structurally strong material. A mounting plate **74** is fixedly secured to a front edge of upper wall **73** and both the fixed end of angled support **200** (as described above) and pneumatic cylinder **20** (best shown in FIG. **1**) are mounted thereto.

Shuttle rail **76** is mounted to a lower edge of upper wall **73** and supports shuttle beam **22**, upon which the robotic grippers **24** are slidably mounted. Further, a horizontal support **78** is mounted to a front edge of rear support **72** and projects forwardly therefrom. A pair of vertical support members **48** are mounted to horizontal support **78**, and the cartridge holder brackets **44** (described above) are mounted to the vertical support members **48**.

As best shown in FIG. **1**, the plurality of rotary cutters **18** are mounted between spindle headstock assembly **12** and removable tail stock assembly **28**. The removable tail stock assembly **28** is removable from the spindle and from table **82**, allowing the cutters **18** to be replaced and/or have the number or spacing of the cutters **18** adjusted. The spindle and cutters **18** are releasably held to tail stock assembly **28** by collar **30** and bolt **32**, which may be removed by the user. Each cutter **18** is separated from the adjacent cutters **18** by a cutter spacer **16**, and the cutter spacer **16** adjacent the removable tail stock assembly **28** is spaced apart therefrom by a spindle nut **14**. Spindle nut **14**, which may be adjustably tightened by the user, maintains the cutters **18** in proper alignment with one another and, through loosening thereof, aids in the removal of tail stock assembly **28**.

As best illustrated in FIG. **2**, each cartridge holder bracket **44** preferably has a substantially C-shaped contour for receiving and releasably holding the cartridge assembly **26** therein. The cartridge assembly **26** is further maintained in proper alignment by cartridge bracket assembly **36**, as shown. Cartridge bracket assembly **36** includes a horizontal support and a pair of cartridge index supports projecting downwardly therefrom, as shown, with the cartridge assembly **26** being received therebetween. With the exemplary nine cutters **18** of cutter assembly **19**, shown in FIG. **1**, the cartridge assembly **26** is indexed to cut approximately between twelve and fourteen inches per cutting cycle and advance the appropriately indexed segment of the stock workpiece for the next cutting cycle.

Pneumatic cylinder **20**, which provides pneumatic drive power for movement of gripping mechanism **24** on shuttle beam **22**, is mounted to bracket **74**, which, in turn, is mounted to upper wall **73** (as best shown in FIG. **6**). The associated rod of pneumatic cylinder **20** is supported by cylinder rod brackets **34**, which are mounted on the shuttle beam **22**. It should be noted that in the preferred embodiment, the robotic grippers **56** have a pneumatic piston driven by a separate air supply for actuation of the jaws to grip the workpiece between the jaws. As best shown in FIG. **2**, a hydraulic cushion bracket **38** is mounted to horizontal support **78** and projects outwardly therefrom for supporting a hydraulic cushion **40**, which acts to stabilize and maintain alignment of the gripper mechanism **24**.

As shown in FIG. **3**, the first robotic gripper mechanism **24** includes a main body portion **54** with a pair of adjustable gripping arms **56** mounted to a lower surface thereof. Under external control (via communication with PLC **310**), gripping arms **56** move in the lateral direction to grasp and release the elongated blank molding strip for cutting thereof. At least one shuttle beam stop block **50** is mounted to the lower surface of shuttle beam **22** and projects downwardly therefrom for stopping the gripping assembly **24** from moving beyond a predetermined position. The shuttle beam stop block **50** contacts the hydraulic cushion **40** of FIG. **2**. It should be understood that any suitable user-controlled gripping mechanism may be utilized in machine **10**. Further, in the preferred embodiment, a pair of stop blocks **50** are provided, one allowing for extension and one for retraction. Similarly, in the preferred embodiment, a pair of hydraulic cushions **40** are provided, one being associated with a respective one of stop blocks **50**. It should be understood that in the simplified FIG. **3**, bracket **44** is not shown. The bracket **44**, clearly shown in FIG. **2**, has been removed in FIG. **3** only for illustrative and simplification purposes.

A pair of shuttle linear bearings **52** are provided and are mounted on the upper surface of shuttle beam **22**, as shown. The shuttle linear bearings **52** slidably receive the shuttle rail **76**. The movement of the robotic gripping mechanisms **24** on the shuttle beam **22** allows for the controlled feeding and removal of the stock and produced molding into and through the cartridge assembly **26** during the cutting process.

If the programmable logic controller **310** is programmed to move the table **82** and the cutter assembly **19** to the proper distance, the notches **120** may be formed with a radius cut in the sides of the teeth **110**. It should be understood that, through the use of user-selectable and programmable controller **310**, the cutter assembly **19** may be positioned to form any suitable variation of the exemplary dental molding, such as those described above or, for example, the further formation of a rounded or radial, cut of the inner corners of notches **120**. It should be understood that through the user-controlled rotation of the cartridge during the cutting process, the user may control the degree of the radial cut in the dental molding, particularly through the controlled alignment and orientation of the cutting head with respect to the cartridge. The radial cut is generated, or performed, as the cartridge rotates while the cutter blades simultaneously engage the cartridge and workpiece.

It is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the following claims.

I claim:

1. A woodworking machine for shaping a molding, comprising:

a frame;

a shuttle mounted on the frame;

a spaced apart pair of robotic grippers mounted on the shuttle, the grippers being adapted for gripping and releasing an elongated blank strip of molding;

a hollow, cylindrical cartridge having opposing end caps, the end caps having openings defined therein dimensioned and configured for supporting the blank strip of molding when the molding is inserted through the cartridge, the cartridge being rotatably mounted on the frame;

a table mounted on the frame, the table being movable both vertically and laterally relative to the cartridge;

a cutter assembly having a plurality of cutters, the cutter assembly being mounted on the table, the table and cutter assembly being movable so that the cutters are positioned to cut through the cartridge and the blank strip of molding when the molding is inserted through the cartridge; and

an electronic control system having means for cyclically actuating the robotic grippers to grip the blank strip of molding, move the shuttle and robotic grippers to advance the molding through the cartridge in indexed increments, actuate the cutter assembly to rotate the cutters, move the table and cutter assembly so that the cutters engage the cartridge and the blank strip of molding within the cartridge to form simultaneous, spaced apart cuts in the blank strip, retract the table and cutter assembly from the cartridge, and repeat the cycle.

2. The woodworking machine as recited in claim **1**, further comprising a user interface in electrical communication with said electronic control system.

3. The woodworking machine as recited in claim **1**, further comprising a spindle motor for driving the plurality of cutters, the spindle motor being in electrical communication with said electronic control system.

4. The woodworking machine as recited in claim **1**, further comprising a pneumatic drive system mounted to said shuttle for driving said spaced apart pair of robotic grippers, the pneumatic drive system being in electrical communication with said electronic control system.

5. The woodworking machine as recited in claim **1**, wherein the openings formed through the end caps of the hollow, cylindrical cartridge define an entry opening and an exit opening, the walls of the end cap defining the entry opening being beveled.

6. The woodworking machine as recited in claim **1**, further comprising an air bag disposed within said hollow, cylindrical cartridge for releasably securing the blank strip of molding therein.

7. The woodworking machine as recited in claim **6**, further comprising means for selectively inflating and deflating the air bag, the means being in electrical communication with said electronic control system.

8. The woodworking machine as recited in claim **7**, wherein the means for selectively inflating and deflating the air bag comprises an air compressor and a vacuum pump.

9. The woodworking machine as recited in claim **8**, wherein an inlet port is formed through a housing of said hollow, cylindrical cartridge, the inlet port being in fluid communication with the air bag, the air compressor and the vacuum pump.

10. The woodworking machine as recited in claim **1**, further comprising a cartridge holder bracket mounted on said frame for releasably and rotatably supporting said cartridge.

11. The woodworking machine as recited in claim **1**, wherein spacing between adjacent ones of the plurality of cutters is user-selectable and adjustable.

12. The woodworking machine as recited in claim **1**, wherein said cartridge is formed from plastic.

13. The woodworking machine as recited in claim **1**, further comprising a pair of spaced apart secondary grippers mounted on said shuttle, said spaced apart pair of robotic grippers and the pair of spaced apart secondary grippers being positioned adjacent opposite ends of said hollow, cylindrical cartridge, the pair of spaced apart secondary grippers being adapted for removing the molding from the hollow, cylindrical cartridge.

14. The woodworking machine as recited in claim **1**, further comprising a pneumatic arm mounted to said frame, the pneumatic arm driving rotation of said cartridge.

15. The woodworking machine as recited in claim **14**, further comprising means for selectively driving the pneumatic arm, the means being in electrical communication with said electronic control system.

16. The woodworking machine as recited in claim **15**, further comprising a pneumatic connector bracket attached to said cartridge and a proximal end of the pneumatic arm, the pneumatic connector bracket joining said cartridge to the proximal end of the pneumatic arm.

17. The woodworking machine as recited in claim **1**, further comprising means for selectively driving movement of said table, the driving means being in electrical communication with said electronic control system.

18. The woodworking machine as recited in claim **17**, wherein the means for selectively driving movement of said table comprises a hydraulic drive system.

19. The woodworking machine as recited in claim **1**, wherein said cutter assembly further comprises:

a spindle, the plurality of cutters being mounted on the spindle;

a headstock assembly; and

a tailstock assembly, the spindle having opposite ends mounted to the headstock and tailstock assemblies, respectively, the plurality of cutters being positioned therebetween.

20. The woodworking machine as recited in claim **1**, further comprising a hydraulic cushion mounted to said frame for stabilizing and aligning said spaced apart pair of robotic grippers.

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